Seasonal changes in the subsurface of the Imhotep region as observed by MIRO

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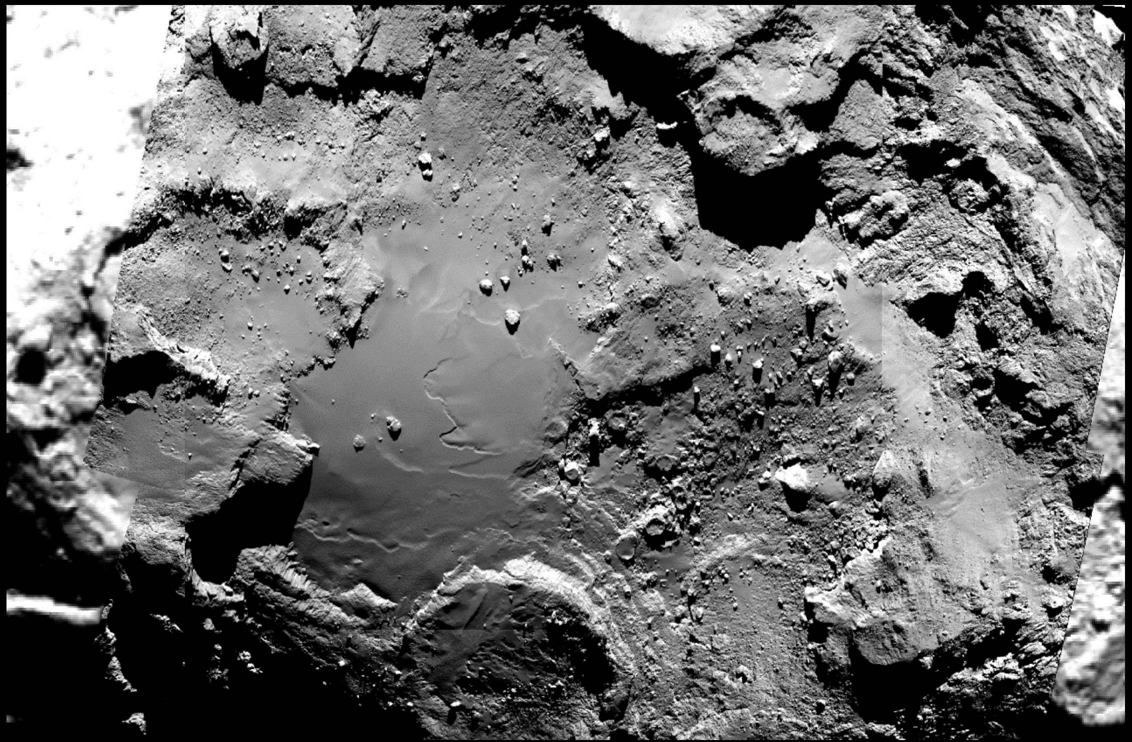

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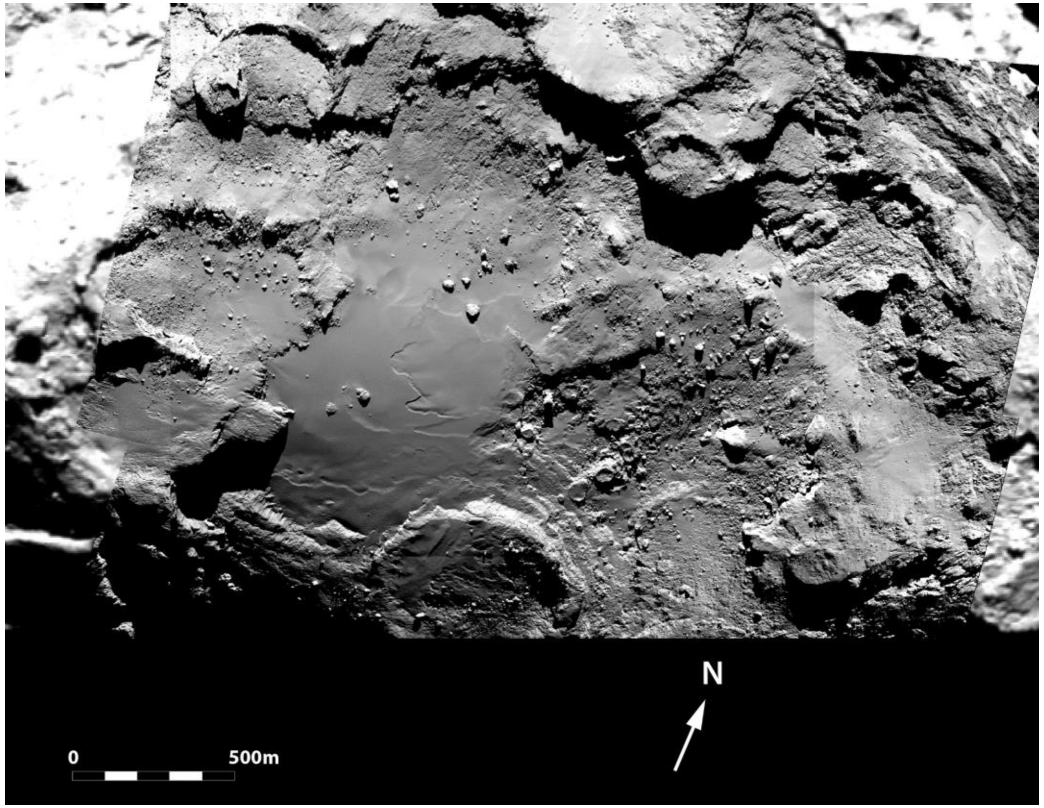
1. Context



The Imhotep region:

- Composed of both rocky and smooth terrain (Auger et al. 2015)

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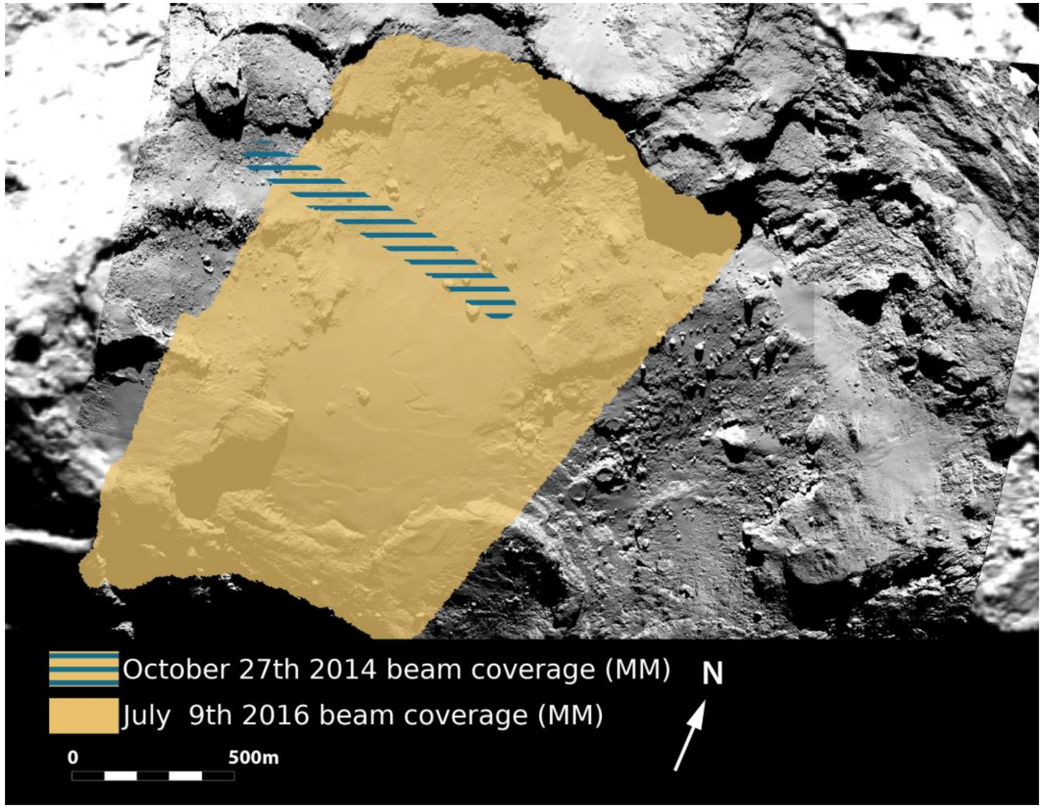

The Imhotep region:

- Composed of both rocky and smooth terrain (Auger et al. 2015)
- Was observed twice by MIRO at very high spatial resolution

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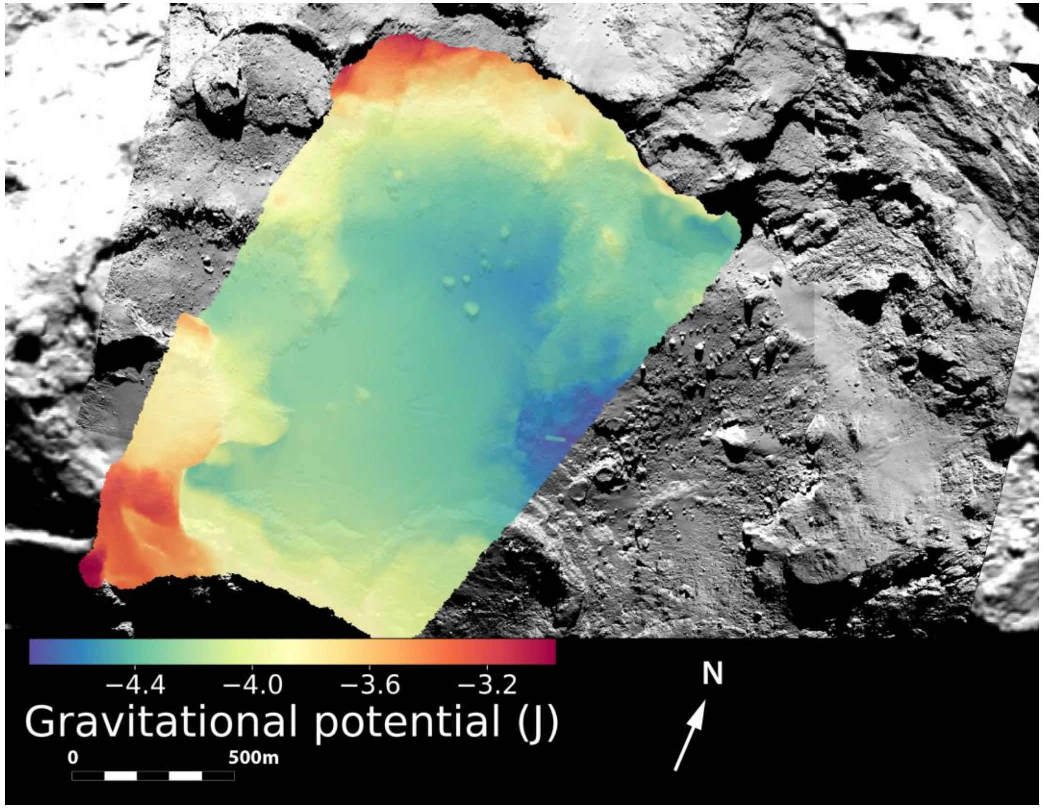
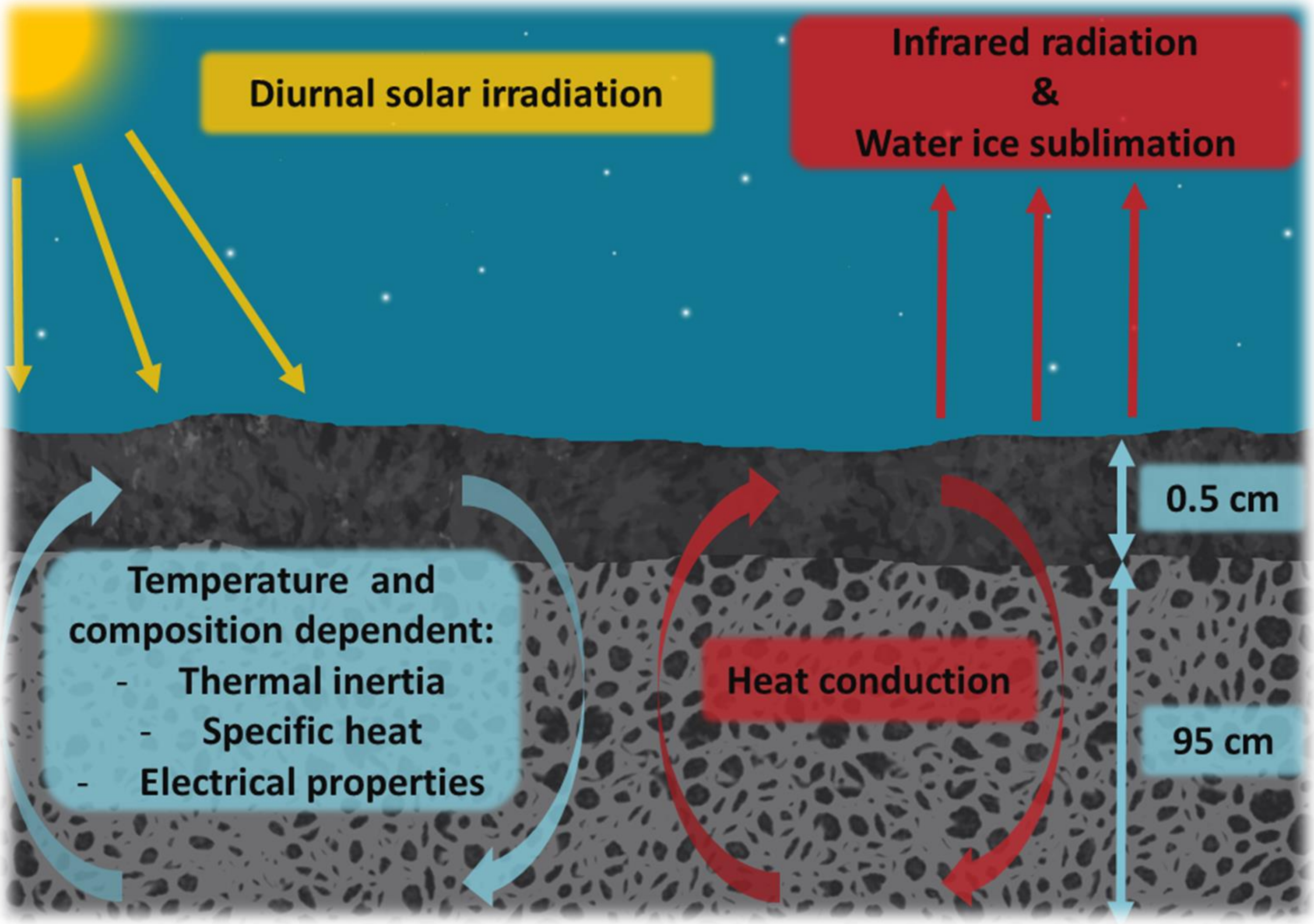


The Imhotep region:

- Composed of both rocky and smooth terrain (Auger et al. 2015)
- Was observed twice by MIRO at very high spatial resolution
- We calculated the gravitational potential using a 3D model of the nucleus (SHAP-7)
- We used the gravitational potential to identify the regions of interest

2. Model & Methods



2. Model & Methods

Input parameters:

- Density of the top layer
- Dust/Ice mass fraction of the top layer
- Density of the bottom layer
- Dust/Ice mass fraction of the bottom layer

↓

Run model for several comet days and nights until it converges to a stable diurnal cycle

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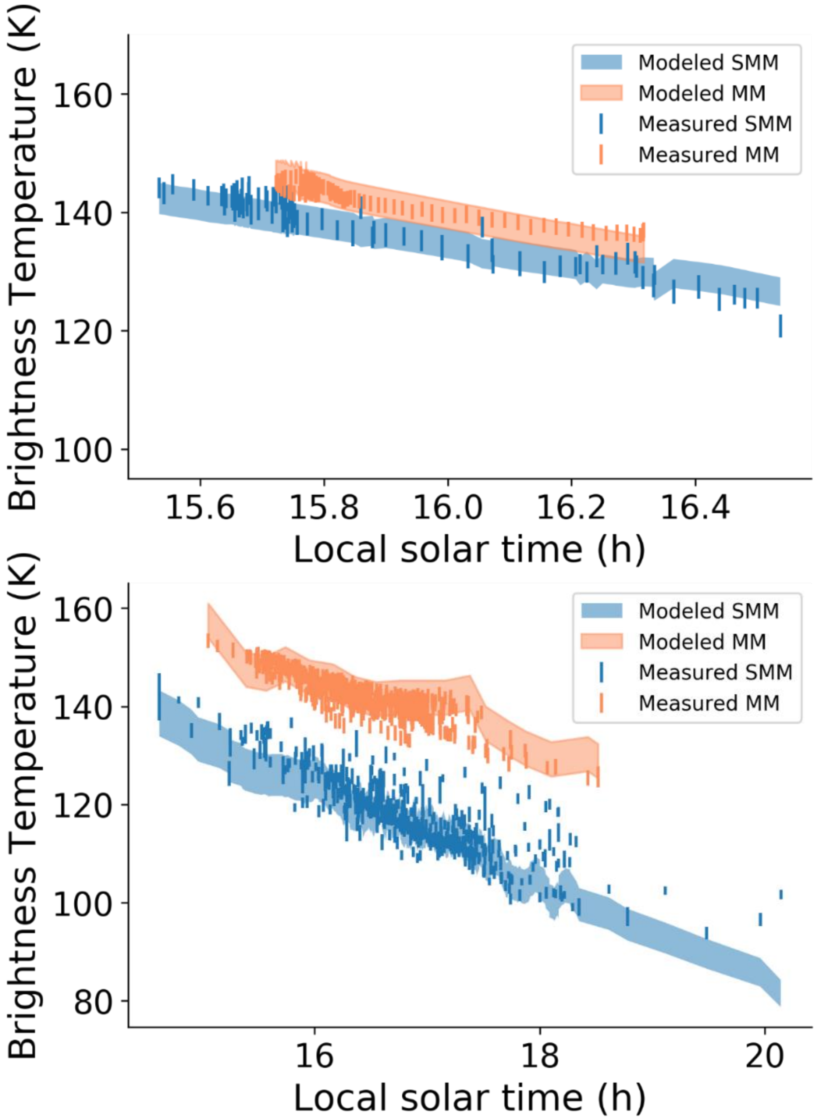
Calculate the root mean square difference between the modeled and observed brightness temperatures

Repeat until a global minimum for the root mean square is found in the space of parameters

3. Results & Interpretation



- For the first time we obtained a good fit in both the SMM/MM channels for both observations of the Imhotep region
- Error bar in the model due to uncertainties in the electrical properties
- The 2016 fit can be improved by being more selective of the areas observed

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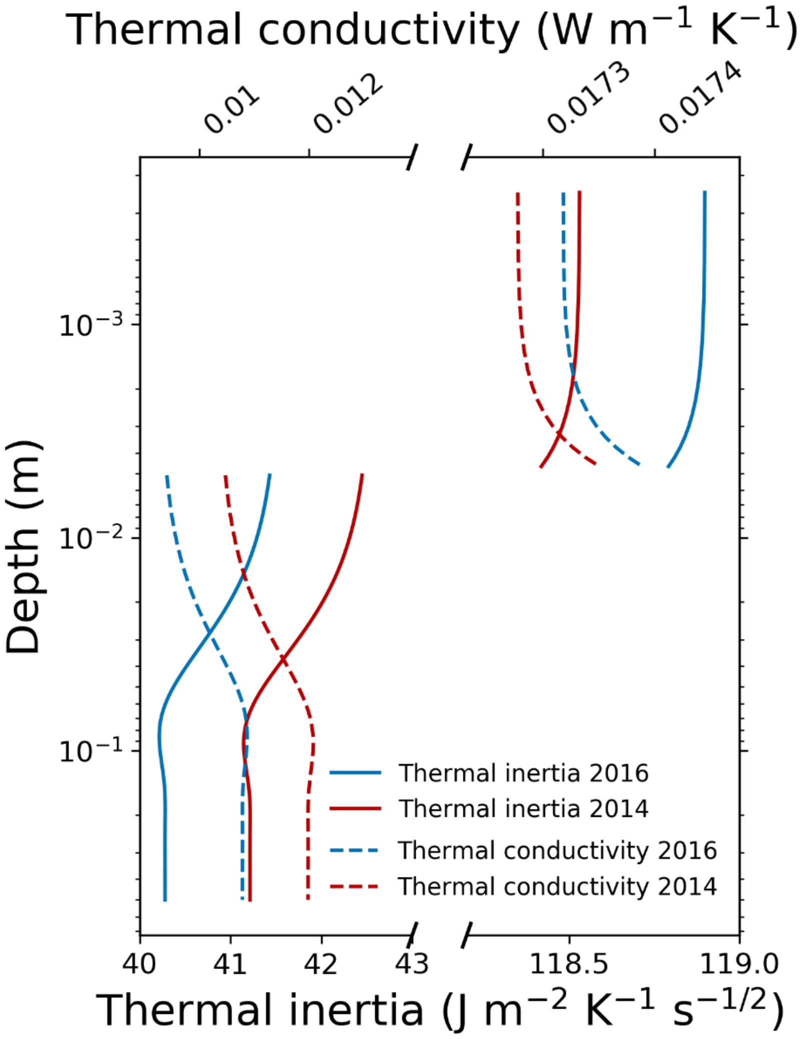
1. Context
2. Model & Method
3. Results & Interpretation
4. Conclusion



- We have a thermally insulating layer on the top
- The thermal inertia increases between 2014 and 2016
- Thermal inertia higher than other MIRO studies
- Closer to the thermal inertia measured by MUPUS (85 +/- 35 J m^{-2} K^{-1} s$^{-1/2}$)

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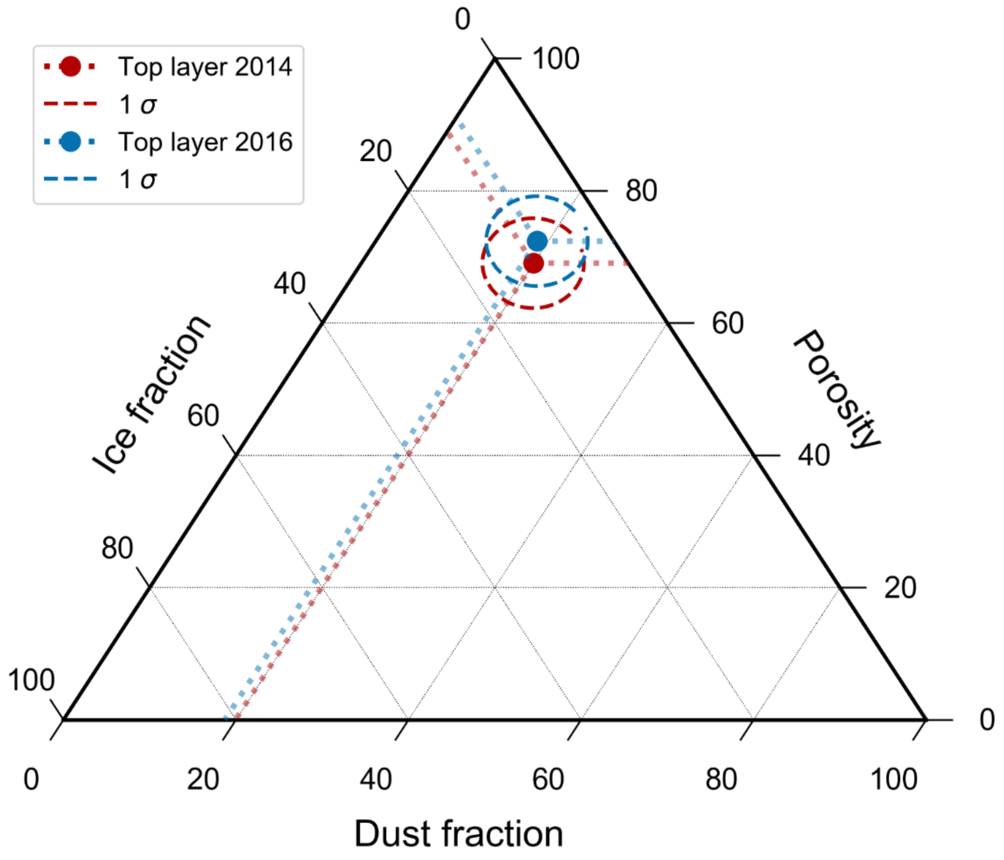
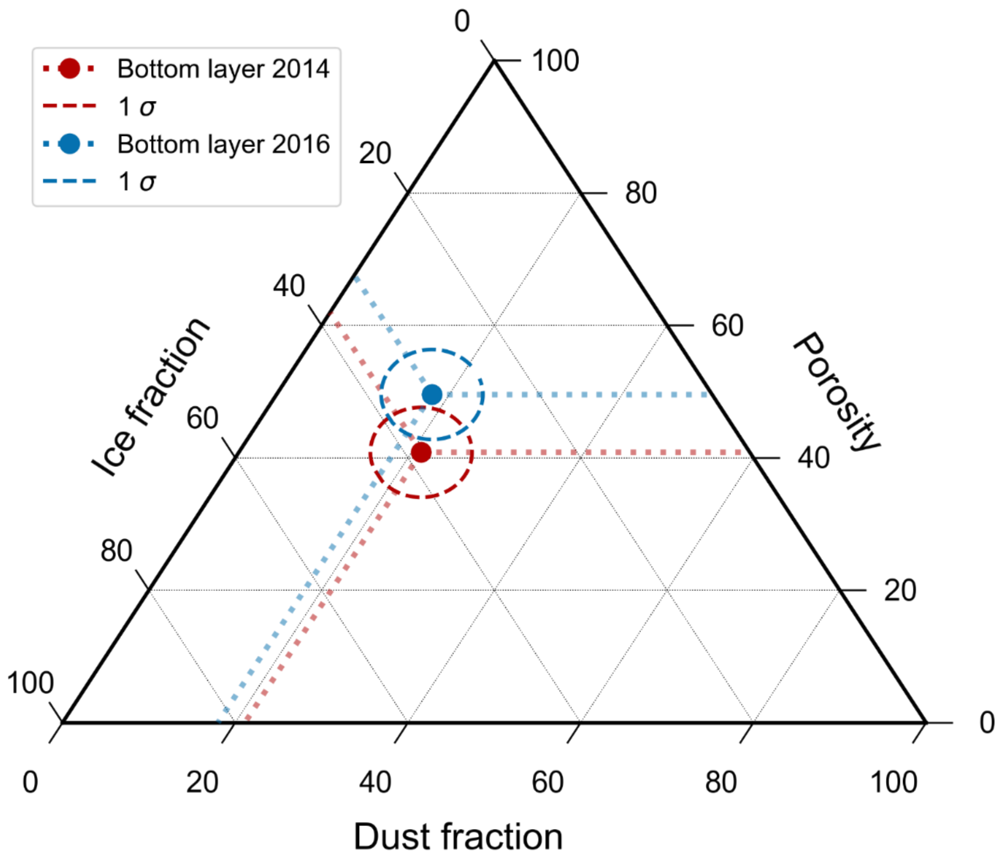


- At both dates we are in presence of top layer composed primarily of porous dust (P > 70 %)
- Between both observations there is small change in the properties
- The change is not significant when compared to the error bar

3. Results & Interpretation



- At both dates we are in presence of bottom layer more compact (P < 50 %)
- The water ice volume in the bottom layer is higher then the dust volume (15-20 % more)
- For the bottom layer the change between the two observations is more significant
- The models seem to imply that there is less water ice and more porosity in 2016.

4. Conclusion

- We obtained for the first time a good fitting model to the high resolution measurements made by MIRO of the Imhotep region
- The best fitting model is a 2 layer surface with a porous dust layer overlaying a more compact dust/water ice layer
- We observe changes in both layers, namely a decrease in water ice content and an increase in porosity
- The changes are consistent with a sublimation of water ice in the subsurface as the comet went by perihelion
- To obtain a good fit, conservative assumptions were made, resulting in error bars on the composition that are as big as the changes observed
- We are working to improve the error bars
- Additional Imhotep measurements could be analyzed to better understand the changes observed